POLLUTION PREVENTION

for Photo Processors

DERM

This booklet provides information about environmental issues and is produced by the Miami-Dade County Department of Environmental Resources Management.

MIAMI-DADE

DERM
DEPARTMENT OF ENVIRONMENTAL RESOURCES MANAGEMENT

Office of Sustainable Environment & Education
33 S.W. 2nd Avenue
Miami, Florida 33130-1540

Pollution Prevention for Photo Processors

Last Update .....August 1999

Published by .....Miami-Dade County
Department of Environmental Resources Management
33 S.W. 2nd Avenue, Miami, Florida 33130-1540
Phone: (305) 372-6789

Director .....John W. Renfrow, P.E.

Asst. Directors .....Carlos Espinosa, P.E.
Alyce Robertson
Dr. Douglas Yoder

Editorial Staff .....David Bromfield, Kristin Buch, Julio Calle

This document is published to help educate businesses and individuals on some of the environmental issues affecting them. It suggests options that may help businesses operate in an environmentally appropriate manner. These options are based on experience and simple common sense ideas. Many of the options go beyond what is required to remain in compliance with the regulations. Please refer to Chapter 24 of the Miami-Dade County Code ("Miami-Dade County Environmental Protection Ordinance") and Chapter 62 of the Florida Administrative Code for specific regulations.

Special thanks to the Florida Department of Environmental Protection (FDEP) for providing funding to supplement the production and distribution of this booklet.

Contact Phone Numbers

MIAMI-DADE COUNTY

Department of Environmental Resources Management
33 S.W. 2nd Avenue, Miami, FL 33130-1540
Online at "http://www.co.miami-dade.fl.us/derm"

Main Switchboard .....(305) 372-6789
Industrial Facilities Section .....(305) 372-6600
(operating procedures, waste handling)
Liquid Waste Transporters .....(305) 372-6804
(lists of waste oil or hazardous waste haulers)
Pollution Prevention (P2) Program .....(305) 372-6784
(p2 information, waste assessments)
Wastewater Section .....(305) 372-6500
(sanitary sewer standards)

Department of Solid Waste Management
8675 N.W. 53 Street, Miami, FL 33166

Main Switchboard .....(305) 592-1776
Recycling Hotline .....(305) 594-1500
South Dade Landfill *(*24000 S.W. 97 Ave) .....(305) 258-2830

STATE OF FLORIDA

Department of Environmental Protection
Twin Towers Office Building
2600 Blair Stone Road, Tallahassee, FL 32399-2400

Main Switchboard .....(850) 488-0300
Bureau of Waste Planning and Regulation .....(850) 487-3299
(EPA hazardous waste permit)
Pollution Prevention Program .....(850) 488-0300
Southeast Region Office (Main Switchboard) .....(561) 681-6600
Emergency State Warning Point 1-800-320-0519

UNITED STATES

Environmental Protection Agency
Region IV , Atlanta, GA .....???-???-????
Small Business Assistance Ombudsman 1-800-368-5888
Waste Reduction Resource Center 1-800-476-8686
(waste reduction information clearinghouse)

INDUSTRY

The Silver Council .....(202) 973-8117
On-line at "http://www.silvercouncil.org/"

Chemical Precipitation

Sodium sulfide or sodium borohydride can be used to precipitate out the silver as silver sulfide. However this must be carried out in an alkaline media to prevent the formation of dangerous hydrogen sulfide gas (H_2S) and subsequent filtering can be difficult because the precipitate is very fine. Concentrations of silver as low as 0.1 mg/L are possible with either chemical but the solutions are generally not reusable for developing.

Silver in Photographic Film or Paper

Undeveloped photographic film or paper can contain a significant amount of silver. Some options include:

- Selling these materials to recyclers for silver reclamation. Many photographic materials/chemicals suppliers offer this service.
- Removal of the silver by treating these materials with a sodium hypochlorite solution to oxidize any silver metal. This solution can then be added to the fixer solution and the silver can be recovered in the same manner as from conventional photo processing waste solutions. Some facilities may choose to use fixer solution that they are preparing for disposal anyway .
- Scrap film or paper can be disposed of in the trash if testing based on the Toxic Characteristic Leaching Procedure indicates levels are below permitted standards for landfill disposal.

Other Solid Waste Reduction Options

Some solid waste items that may be recycled include

- 35 mm plastic film tubs and lids
- 35 mm metal magazines,
- 35 mm plastic spools
- one-time or single use cameras
- old film and photographic paper
- lead foil from intra-oral dental film

For more information contact your local supplier, or manufacturers such as:

Kodak Information Center: 1-800-242-2424
http://www.kodak.com/go/kes/

Fuji Photo Film USA: 1-800-755-3854
http://www.fujifilm.com/home/

Printed on paper

TABLE OF CONTENTS

Why Should I Read This Booklet?

It's written for you!

Special efforts have been made to produce a booklet that is informative and easy to read. Although there is a great amount of information included, it is presented in a clear and understandable format.

It's the law

As a business owner, operator, or employee, you are responsible for complying with many federal, state, and local regulations. This booklet can help you to comply with those regulations.

It's your money

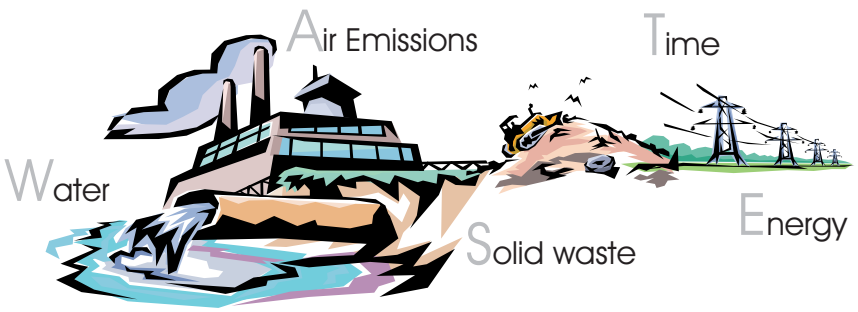
The proper handling and disposal of wastes can be expensive. Furthermore, the improper handling or disposal can lead to even more expensive clean-up costs and fines. By reducing the amount of waste that your business generates, some of these costs can be avoided.

It's our environment

We all breathe the same air, drink the same water, and walk on the same land. When we pollute the environment we are only hurting ourselves and our children.

Wastes Are Important

Wastes can be found in many different forms. Although we are especially concerned with those wastes that are toxic, all wastes should be reduced or eliminated when possible. Anything that does not leave your business as a product or service is a waste. What types of wastes are at your facility?



Hazardous Wastes

A waste is considered a ***hazardous waste*** if:

1) It has any one or more of the following characteristics:

Ignitable (D001)
Ignitable wastes are easily combustible or flammable. They have a flashpoint of less than 140°F or an alcohol content of 24% or more. *(The flashpoint is the lowest temperature at which the vapor of a combustible liquid can be made to ignite in air.)*

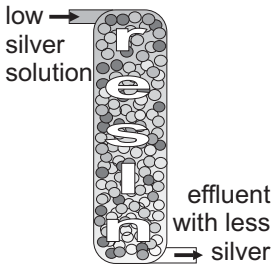
Corrosive (D002)
Corrosive wastes are liquids that dissolve metals and other materials, or that burn the skin. They have a pH of 2 or lower, or 12.5 or higher.

Reactive (D003)
Reactive wastes are unstable and react rapidly or violently to shock, heat, or pressure, or when mixed with water or other materials.

Toxic (D004)
Toxic wastes generally have adverse health effects. They need only contain a small amount of a certain material such as heavy metals or toxic organics.

recirculating in-line units. Check with your suppliers to determine if you should be using a fixer with an increased level of sulfite.

Ion Exchange Columns



Silver in solution at low concentration levels can be removed by pumping the solution through an ion-exchange resin column. However, because high concentrations can quickly overload these units, this technology is only suitable for wash water and not for fixer solutions. It may also be used as a final polish for silver solutions already treated by some other technology.

This process is a reversible exchange of ions between a solid (resin) and a liquid (a solution containing ionized salts). In this case of low-silver concentration solutions, the silver thiosulfate is adsorbed to the resin. Periodically that column can be removed and the resin rinsed with a dilute sulfuric acid solution to decompose the silver thiosulfate to silver sulfide, which remains in the ion exchange column. Thus the resin is "recharged" and may be used for many cycles before it is ultimately incinerated and the silver recovered. Silver recovery is usually done off-site.

A single column can reduce silver concentrations in wash water by up to 90%, and two columns in series can reduce levels by up to 99%. With this technology concentration levels as low as 0.1 ppm are achievable.

Thiosulfate concentration

High thiosulfate concentrations can actually cause silver to be stripped from the resin and back into solution. That's another reason why untreated fixer solutions are not suitable for ion exchange units. One suggestion has been to de-silver silver rich solutions through some suitable method such as an electrolytic unit, and then, at a rate that matches the normal replenishment rate for the solution, meter the de-silvered solutions into the wash water overflow. This wash water is then passed through the ion exchange column.

Flow rate

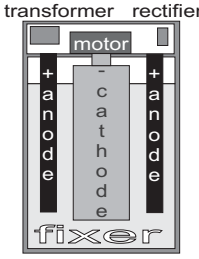
The proper sizing and use of a metering pump (or at least a flow restrictor in low volume situations) is essential. If the solution flows through the column too quickly, there will not be enough time for the reaction to take place. A typical limit is 1 resin bed volume per minute. Periodic recalibration of the meters is important.

Biological growth control

Algae, bacteria, and fungi grow readily in ion exchange columns, feeding on dilute film processing chemicals. This can form a film on the resin bed, and/or obstruct the flow of solution. The columns will probably need to be flushed with biocide periodically.

Electrolytic Silver Recovery Units

In the electrolytic recovery of silver, a controlled direct electric current is passed between two electrodes suspended in the silver rich solution. The negatively charged electrode is referred to as the "cathode" and is typically made of stainless steel. The positively charged electrode is referred to as the anode. Silver "plates out" on the cathode as an almost pure metal and thiosulfate is oxidized at the anode.



The amount and quality of the silver that plates out and the efficiency of the process, is controlled by:

- the concentration of silver in the solution
- the operating amperage
- the time that the solution is exposed to the current
- the movement of the solution across the electrodes

Electrolytic units are available either as batch units or as flow-through units. Batch units start operating once a certain solution fill level is reached. Flow-through units operate continuously and recover silver as the solution re-circulates through the unit.

In some cases the silver bearing solution can actually be reused. Unfortunately very low levels of silver concentration can not be achieved with this method alone, and it is often used in conjunction with one of the other treatment systems. Some tips for better performance include:

Silver concentration

The plating efficiency is greater when the concentration of silver in solution is higher. Therefore watch/minimize replenishment rates for solutions.

Time and amperage

Most modern units operate automatically, but if you are manually adjusting plating current or batch time you should know that more is not always better. If the current is too high or the time too long, the silver plated out will be black and sludgy, usually sliding of the cathode to the bottom of the unit. (This is known as "sulfiding" and results in messy low-quality silver.) The cathode may eventually become coated with a black sulfide precipitate, rendering it unsuitable for future silver recovery. Follow your manufacturers recommendations.

pH

Little or no pH adjustment may be necessary for reuse of fixer solution. It is recommended that a pH of 8.5 not be exceeded as this can result in significant levels of ammonia air emissions.

Sulfite concentration

Sulfite, an essential component of the fixer, is consumed from the solution as silver is plated out, and can be a problem especially with continuously

OR 2) It is listed as a hazardous waste in the Code of Federal Regulations, 40 CFR Part 261. This list is very long and may include chemicals that you use daily. If you are unsure, it is suggested that you refer to the list cited and have your waste tested by a laboratory.

Handling and Disposal of Hazardous Wastes

The proper handling of hazardous wastes is very important in order to ensure the health and safety of the public and to protect the environment. Some important things to remember are:

- Never pour waste fluids on open ground, in storm drains, or down shop drains.
- Never mix hazardous and non-hazardous wastes. Even a little hazardous waste can make the entire mixture hazardous and more expensive to dispose of properly.

Containers

- Maintain containers in good condition. Prevent leaks, ruptures and the accumulation of rainwater on the top of drums.
- If a container leaks, transfer all of the waste to a new container.
- Keep lids on, and containers closed, when not in use.
- Use funnels when pouring liquids.
- Use containers that are compatible with the waste being stored.
- Don't mix different or incompatible wastes in the same container.

Labels

Proper labeling can reduce accidents and ensure proper disposal.

This label shows some of the information that should be included.

HAZARDOUS WASTE
(or NON-HAZARDOUS WASTE)
FEDERAL LAW PROHIBITS IMPROPER DISPOSAL

If found, please contact the nearest police or public safety authority or the U.S. EPA.

<type of waste>

<your business' name and address and manifest document number>

<accumulation start date>
(the date when waste was first put in the drum)

<federal waste code numbers>

Waste Storage Areas

- Try to store all hazardous wastes in a single area but do not store incompatible items beside each other.
- Identify waste storage area with appropriate signs.
- Satellite collection points are allowed for work-in-progress, but containers should remain covered when not actively in use and be moved to the main storage area once filled or not in use.
- Secondary containment should be provided that is able to contain at least 110% of the largest container's capacity in case of leaks, spills, or punctures. It must have an impermeable (sealed with compatible coating) surface and should be under cover, preferably indoors. Plan approval may be needed.
- Ensure that there is sufficient aisle space between drums to allow complete inspection for proper labeling and any leaks or damage.
- *Check with the Fire Department for their requirements.*

Transportation and Disposal

- Hazardous wastes must be shipped out by an EPA and DERM permitted hauler to an EPA approved treatment, storage, and disposal facility. (See p. 19 for contact information.)
- Use reputable permitted companies for transport and disposal. You are forever liable for any hazardous waste that you generate; a "cradle-to-grave" liability. Even if you have proper documentation, you may still be a potentially responsible party to a clean-up if your waste contributes to the contamination of the environment.

Inspections and Record Keeping

- Any facility generating a hazardous waste should obtain an EPA identification number. (See p.19 for contact information.)
- Keep all records of hazardous wastes handled on-site for at least three (3) years. This includes manifests and any other records documenting amounts stored, reused, or hauled away for disposal.
- Keep records of lab tests for at least three (3) years.
- Keep land disposal restriction forms for at least five (5) years.
- Inspect storage containers and areas for leaks or damage at least once per week and maintain a written log on-site for at least three (3) years.
- Keep any training records for at least three (3) years.

Metallic Replacement

Metallic replacement is a relatively low cost method of achieving fairly high levels of silver recovery. In metallic replacement, a more active solid metal, such as iron, can be used to displace another metal, in this case silver, from solution. The silver that was dissolved in the solution is reduced to metallic silver and falls out of solution. This exchange reaction is dependent on the silver-thiosulfate in the solution contacting with the with the iron surface. The silver is then recovered as a sludge. Single cartridges can reduce the silver concentration up to 90% and two in series can reduce it by up to 95%. However, the effluent solution now has a high iron concentration.

Good metallic replacement cartridges ensure that a controlled contact is achieved by metering the silver solutions through a cartridge of iron. They contain iron in the forms such as chopped steel wool, spiral wound steel wool, a heavy iron mesh, or iron chips embedded in a fiberglass support.

Cartridge capacity

Each cartridge has a limit to the amount of solution that can be treated to recover silver. Manufacturers generally provide a rating in terms of gallons of solution or time- whichever comes first.

Measure and log

Use silver test papers to check periodically (depending on volume) for silver break-through and replace cartridges immediately if necessary.

Flow rate:

The proper sizing and use of a metering pump (or at least a flow restrictor in low volume situations) is essential. If the solution flows through the cartridge too quickly, there will not be enough time for the replacement reaction to take place. Periodic recalibration of the meters is important.

Channeling:

Small channels may begin to develop in the iron material as the active surface area is used up. The solution then flows through these low resistance channels and comes in contact with very little of the iron media. Some tips for countering this are to:

- Select the proper sized cartridge for your average volume of solution.
- Fill the cartridge with water each time before adding the solution.
- Regulate flow rates based on the manufacturer's recommendations.

Obstruction:

Obstruction of the cartridge due to physical damage or the build up of rust can restrict the flow of solution and may even lead to leaks

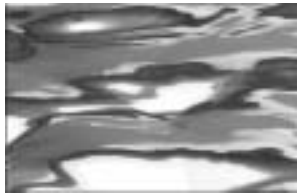
- Rinse lines with hot water periodically if there are several hours each day when no solution is flowing through the cartridge.

pH

The optimal pH is for metallic replacement is usually between 4.5 to 5.5. Too low a pH results in the iron media etching too quickly. Too high a pH and too little etching occurs so the replacement reaction can't take place.

Silver Recovery From Photo Processing Solutions

The silver contained in wastewaters from photoprocessing makes the collection and treatment of these chemicals an environmental requirement as well as an economical necessity for most companies. This silver can be recovered in some form and then often sold.



In Dade County the current sanitary sewer discharge limit for silver concentration is 0.4 mg/L (ppm). Silver dischargers will want to check with the DERM as this limit may change.

Treatment and recovery options for silver bearing solutions may include one or more of the following:

- Evaporation / Distillation
- Off-site treatment
- Metallic replacement
- Electrolytic recovery
- Ion exchange
- Chemical precipitation

Evaporation/ Distillation

Evaporation is not a treatment option by itself, but rather a method used to reduce the volume and increase the concentration of silver solutions prior to utilizing one of the other treatment options. The remaining concentrated solution or sludge must be treated properly. Evaporation can make the other options more effective and reduce costs. The equipment is usually considered a distillation unit if the distillate is captured and condensed. This distillate is usually "pure" water that can be reused.

Off-site Treatment:

Silver bearing wastes can be shipped off-site by an approved hauler for treatment and recovery at an approved facility. Solutions containing more than 5 ppm silver are generally considered hazardous wastes under the Resource Conservation and Recovery Act(RCRA). There are specific requirements for hazardous waste generators, including proper labeling, storage, disposal and reporting guidelines. Some of these are very briefly described on p. 4 - "Hazardous Wastes." This wastes may be in the form of silver bearing solution or sludges.

Even the metallic silver that is recovered by one of the other methods is usually sent off-site to a metals recycler. One of the advantages to recovering metallic silver on-site first is that the facility receives more money for higher quality silver and avoids some of the hazardous waste generator requirements.

Regulated "Non-Hazardous" Wastes

Although not classified federally as hazardous wastes, there are many materials that are regulated stringently in Miami-Dade County. When in doubt, treat a material as a hazardous waste until you are able to verify that it is not. Always determine what are the correct handling and disposal procedures. Some common examples of these wastes are: used radiator fluid, lubricating oil, transmission fluid, brake fluid, or power steering fluid.

Air Emissions

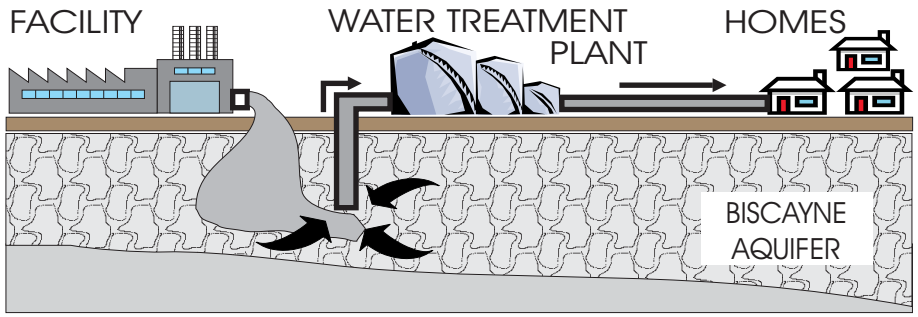
There are many pollutants that are released into the air through evaporation, combustion processes, or otherwise. The release of many of these chemicals is regulated and requires an air permit depending on the quantity released or used. This includes pollutants such as particulates, sulfur dioxide (SO_2), carbon dioxide (CO_2), nitrogen oxides (NOx), chlorofluorocarbons (CFCs), Volatile Organic Compounds (VOCs), and many "Hazardous Air Pollutants" (HAPs).

Hazardous Materials

Although less stringently regulated than hazardous ***wastes***, the proper storage and handling of hazardous ***materials*** is equally important. Many of the storage and handling practices described above for hazardous wastes should, and in some cases must, be applied to hazardous materials as well. This includes certain labeling and spill prevention measures.

Storage Tanks

- Plans must be submitted to DERM and approved prior to installing, modifying, repairing, or removing any storage tank system.
- Most tanks require a current state registration and DERM operating permit.
- Regulated tanks must have an approved leak detection system.
- Ensure that tanks, lines, and dispensers, are constructed of proper corrosion resistant materials.
- Consider removing smaller underground tanks, such as waste oil tanks, and replacing them with above ground storage systems.
- If you have any questions about underground storage tanks please contact DERM's Storage Tanks Section (see p. 19).



In South Florida our drinking water comes from the water that fills the tiny cracks and pores in the rocks just a few feet below us. This water is pumped up to a treatment plant and then out to our homes. That's why we all must be careful not to contaminate the ground or groundwater.

Where Does That Drain Go?

It's important to know what types of drains are at your facility:

Storm Drains

These drains are for ***rain water only!*** They are usually found along streets or in parking lots, and discharge directly to a nearby body of water (lake, canal) or allow the water to percolate into the ground. Keep the area around these drains clean and free of spills and debris.

Drains Leading to Septic Tanks

These drains are for ***domestic wastewater only!*** Septic tanks allow a short holding time for bacteria to start breaking down domestic waste. From there wastewater goes directly into the ground. Industrial wastewater (even small amounts from washing chemicals off of hands) should never be allowed down these drains because:

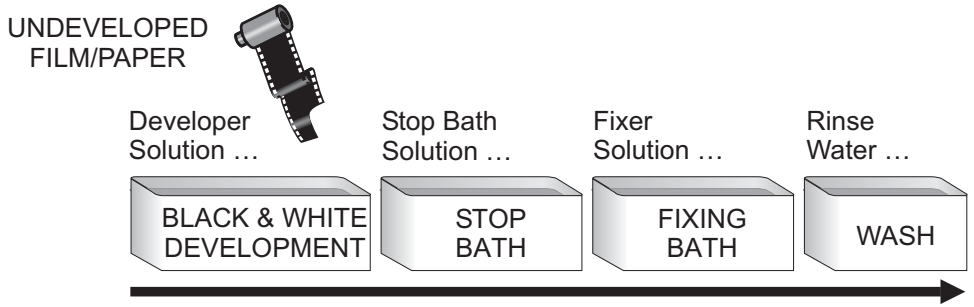
1) It can kill the bacteria, often requiring a costly tank pump out.
2) It can directly contaminate our drinking water.
3) It can contaminate your property, requiring expensive clean-ups.

Drains Leading to Sanitary Sewers

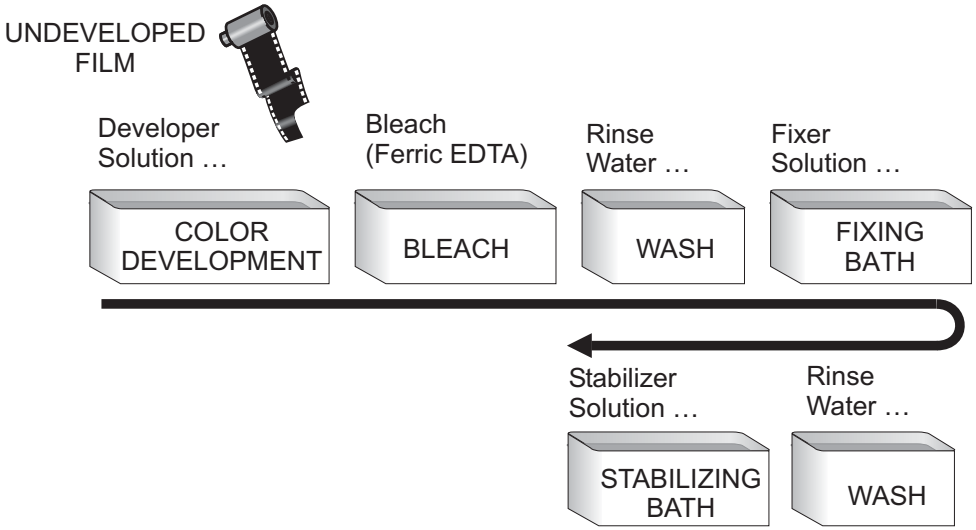
These drains are designed primarily for domestic wastewater, but can tolerate very low levels of industrial contaminants. A list of these contaminant levels is available (see p.19 *"sanitary sewer standards"* for contact information). Sanitary sewers are a network of pipes that carry wastewater to a treatment plant and then it is discharged into a nearby body of water (such as miles offshore).

REMEMBER: Never pour flammable solvents into any sewer system. This may cause an environmental and/or fire and explosion hazard.

Typical black-and-white photographic materials



Typical color photographic materials *(negative film)*



Waste materials

These and related processes can produce wastes including:

- ☹ Developer .....*hydroquinone*
- ☹ Fixer (or bleach fixer).....*high silver concentration*
- ☹ Processing bleach.....*high silver concentration*
- ☹ Washless stabilizer ..... *high silver concentration*
- ☹ System cleaners ..... *high chromium concentration or pH*
- ☹ Rinse water ..... *(low) silver concentrations*
- ☹ Scrap film and paper..... *solid waste*
- ☹ Plastic film containers..... *solid waste*

What's the Concern with Discharging Silver?

Silver is the primary toxic waste generated by photo processing. This may be confusing because we see and use silver without harm almost every day. We wear silver jewelry, eat off silverware and may have silver fillings in our teeth. However silver exists in different forms. The metallic silver forms we have mentioned are considered non-toxic. However, dissolved silver, the silver cation (Ag^+) is very toxic to aquatic organisms.

It should also be noted that the silver ion is very reactive and will quickly form compounds with other materials in the environment such as sulfides or chlorides. These compounds have varying levels of toxicity and some are even considered non-toxic. The silver found in used film processing fixer is usually in a non-toxic form of silver thiosulphate. However, there are no guarantees as to what form discharged silver will take, and so regulations are usually based on the total concentration of silver.

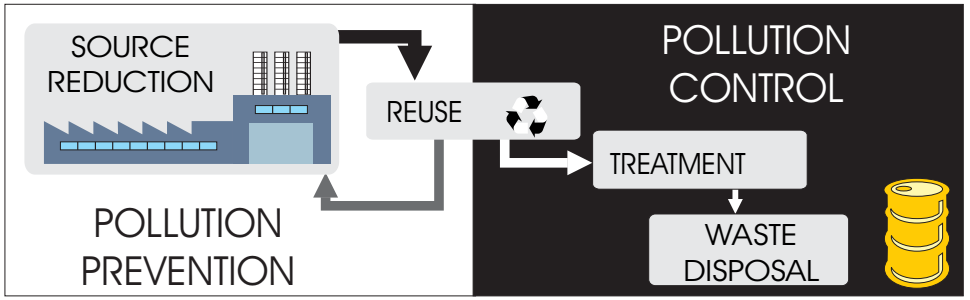
Developing Silver Based Photographic Materials

On the next page are simplified flow charts for black-and-white and color film developing. Some steps for reducing the wastes generated include:

- **Using a "stop bath"** containing a weak acid, usually acetic acid, prior to the fixer can help to neutralize any alkaline developer carried over on the film.
- **Monitoring and regularly reducing silver concentrations in fixing baths** is important. Above a certain concentration level (~2 grams/liter) insoluble compounds are formed that can not be readily removed from the photographic emulsion. In addition, reducing the concentration of silver in the fixer, reduces the amount of silver that is carried over into the rinse water. It is generally easier and cheaper to remove silver from high concentration solutions.
- **Using "squeegees" to wipe off excess solution** from the film before moving to the next step in order to reduce the carry over of chemicals. It's important that they are used only after the film image has hardened.
- **Using a multi-stage rinse with counter-current flow** instead of single stage rinsing. Fresh water enters the final rinse tank and then flows from there to the first rinse tank. Wastewater flow from the first rinse tank can then go to an approved treatment system and then to sanitary sewers. This can reduce rinse water use by up to 90%.
- **Pouring processing chemicals into storage containers** until needed again. This is especially useful for small, manual developing operations. All operations should cover tanks and containers when not in use to reduce the chance of spills or contamination of chemicals.

What is Pollution Prevention?

Once you have generated a waste or pollutant your only choice is pollution *control* (treatment and disposal). What if instead, you reduced or eliminated the wastes or pollutants at the source? Then you would be doing pollution ***prevention*** by avoiding the creation of wastes in the first place! This booklet provides information on both pollution ***prevention*** and pollution ***control***.



Benefits of Pollution Prevention

- Reduced operating costs through increased efficiency.
- Reduced risk of liability.
- An improved company image.
- Protection of the public health and the environment.

Implementing Pollution Prevention

Too often things are done a certain way because, "It's always been done that way." Well it's time for a change! DERM is encouraging every business to reduce its waste by implementing a pollution prevention program. Here's how:

- Make a commitment to pollution prevention.
- Encourage employees to participate and make suggestions.
- Evaluate the types and quantities of wastes that are generated.
- Find ways to reduce the amount of waste that is generated.
- Make the changes necessary to reduce wastes.

Many waste reduction options are based on common sense and are inexpensive to implement. This booklet contains some ideas to get you started. Your shop may already be using pollution prevention practices without realizing it. Don't forget, *"An ounce of [pollution] prevention is better than a pound of cure."*

Permits

Most industrial facilities in Miami-Dade County are required to have a permit from DERM. Permits are required for shops performing photo processing, including film developers, printers, medical facilities, and those performing industrial non-destructive x-ray testing. In addition, there may be other permits that are required from DERM and other environmental agencies. These can include permits related to air emissions, hazardous waste generation, and medical wastes. Do you have current permits for your activities? (See p.19 for contact information.)

Digital Imaging

Significant advancements in computer technology, and the accompanying reduction in costs, have made digital imaging and desktop publishing accessible to many people. From home enthusiasts to professional publishers, many users have already, and are continuing to switch from traditional films to digital imaging.

Many photographers now have a choice of using traditional silver based films that are developed with chemicals, or switching to digital photography and utilizing personal computers.

Similarly the printing industry has seen that many photography-related and other pre-press functions such as typesetting, scanning, retouching and separations, that were done by specialty service providers with analog tools, are now being done digitally by the design community or printers directly.

Each technology has its benefits and disadvantages. For many, the traditional silver based films still offer a higher resolution and image quality, for a low up front cost. Some disadvantages include the development time, chemicals, and recurring costs. There may also be minimal benefits if images are going to be scanned in for digital retouching or manipulation anyway. Others see real benefits in the ability of digital imaging to capture an image that can almost instantly be transferred into an electronic format, for manipulation or data transmission. However, up front costs are still comparatively high, particularly if large capacity storage memory for many pictures is included.

Computer-to-Plate (CTP) Technology

Gravure printers have been able to implement an all digital pre-press workflow for years and now offset printers are beginning to emulate this trend through computer-to-plate technology. In the CTP process all of the images that will be printed are plotted directly to the printing plate from digital data without intermediary film. Thus, every plate is a “master“ made directly from the same digital data. The CTP process can produce sharper dots than conventionally imaged plates that register better, more faithfully reproduce more of the tonal range, generate less dot gain and significantly accelerate make-ready on press. Customers generally benefit from having more flexibility in shorter front-end turn-around time.

Photographic Films (and Papers)

Although silver halide films are the most common type of photographic media, there are other media available. The substrates used are generally polyester, vinyl acetate, or glass.

- **Silver halide films** are coated with a photographic emulsion that typically includes silver chloride or silver bromide salts suspended in a gelatin.
- **Vesicular films** are coated with a thermoplastic resin and a light-sensitive diazonium salt. These films take longer to develop but avoid silver disposal problems.
- **Photopolymer films** use carbon black and the films are processed in a weak basic solution. These films also take longer to develop but avoid silver disposal problems.
- **Electrostatic films** depend on an electrostatic charge makes the film light sensitive, and a liquid toner brings out the image after the film is exposed to light. These films develop at about the same rate as silver halide films and offer a very high resolution. They also avoid silver disposal problems.

Facilities that are not exclusively photo processors and are able to choose their film medium, may want to investigate these other types. This evaluation would include production quality, costs, and any potential environmental issues.

IMPORTANT

IMPORTANT

PLEASE ANSWER THE FOLLOWING QUESTIONNAIRE

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL

FIRST-CLASS MAIL PERMIT NO.23208 MIAMI,FL

POSTAGE WILL BE PAID BY ADDRESSEE

MIAMI-DADE
DEPT OF ENVIRONMENTAL RESOURCE MGMT
33 SW 2ND AVE # 1200
MIAMI, FL 33130-9918

The Pollution Prevention Program is conducting this brief and anonymous survey in order to determine the best manner to provide assistance to your business.

1) The information provided in this booklet was:

A. Very easy to understand
B. Easy to understand
C. Difficult to understand
D. Very difficult to understand

2) The content of this booklet should be:

A. More technical
B. Less technical
C. Just as technical

3) Of what informative value is this booklet to you and your business?

A. It needs more detailed information
B. It has too much detailed information
C. It has enough information

4) What type of information from the booklet will help you the most in your business?

A. General environmental information
B. Environmental regulations
C. How to prevent or eliminate pollution
D. An alternative to chemical products
E. The handling and disposing of hazardous waste
F. Contact telephone numbers

5) Which of the following suggestions mentioned in the booklet have you put to practice?

A. Inventory control
B. Raw material changes
C. Equipment changes
D. Process change
E. Employee training

Please circle your answer to each question, tear along the perforation and mail in your response.
For more information call 305-372-6784.

1) A B C D

2) A B C

3) A B C

4) A B C D E F

5) A B C D E

6) Please add any other comments or suggestions:

_____

_____

_____